All of the information in this report is preliminary and subject to further evaluation. Information may not be published or quoted without the permission of the Project Director. Manipulation of these data beyond what is contained in this report is discouraged.

PROJECT DESCRIPTION

The goal of this study is to evaluate and demonstrate the effects of sage-grouse friendly livestock grazing strategies, created by the Natural Resources Conservation Service (NRCS), on the population dynamics of greater sage-grouse (*Centrocercus urophasianus*; hereafter sage-grouse) as well as sage-grouse habitat. To this end, we monitor sage-grouse hens on Sage-grouse Initiative (SGI) contracted lands and compare these data with data from hens that we monitor on areas where there are no SGI grazing systems (non-SGI). In addition, hens were monitored for presence / absence on the Lake Mason National Wildlife Refuge (NWR; hereafter the Refuge). We have completed 4.5 years (corresponding with 4.5 years since the initiation of SGI) of this 10 year study. The Refuge is an extension of our initial study area that we began evaluating in 2014. This report includes information regarding the entire project and study area as well as progress specific to the Refuge in 2014. Work completed for the entire study includes capturing and marking adult females ("hens", ≥1 yr old) with radio transmitters, finding and monitoring nests, capturing and marking sage-grouse chicks with radio transmitters, and measuring key vegetation characteristics in sage-grouse habitat and among grazing treatments.

OBJECTIVES AND ALTERNATIVES

The short-term objective of this 1-year funding period was to study the direct effects of livestock grazing on vital rates of sage-grouse and on sage-grouse habitat in Musselshell and Golden Valley counties, Montana (Fig. 1) during the 2015 field season. We continued the collection of data to help evaluate the effectiveness of SGI grazing systems as a habitat management tool for stabilizing or improving sage-grouse habitat and populations. We expanded our study area to the Refuge in 2014, where no grazing has occurred for 12 years.

Adult hen survival, nest success, and chick survival are the three most important factors influencing the population growth of sage-grouse—more influential than, for example, nest initiation dates or clutch sizes (Taylor et al. 2012). Past research has shown that vegetation variables such as taller grass height translate into higher nest success for sage-grouse hens (Doherty et al. 2010). Thus we collect data to evaluate the direct effects of grazing treatments on these vital rates and sage-grouse habitat. We have the following long-term objectives:

1. Measure and compare the vegetation response in pastures among different grazing treatments, relative to published sage-grouse habitat needs;
2. Measure individual vital rates known to impact population growth in sage-grouse and relate these estimated vital rates directly to habitat variables and other important drivers; and
3. Identify seasonal movements and habitat selection by sage-grouse hens and chicks to quantify use of different grazing treatments proportional to habitat availability and other drivers of sage-grouse resource selection.

METHODS AND PROTOCOLS

Radio telemetry is the main technique we use to collect data on hen survival, nest success, chick survival, and habitat use. We collect vegetation data at nests and randomly selected sites in potential sage-grouse nesting habitat to measure the influence of vegetation and grazing treatments on sage-grouse vital rates and resource selection. We also collect vegetation data in different grazing treatments to evaluate the effect of grazing on sage-grouse habitat (hereafter vegetation response

plots). These treatments include: SGI-Rested, SGI-grazed, Non-SGI, and Refuge (Lake Mason satellite refuge units of the Charles M Russle NWR). For this report we focus on the vegetation response plots sampled on the Refuge.

PARTNERS

Representatives from 6 agencies/organizations have been involved with or provided support for this project.

- David Naugle, Associate Professor, Wildlife Biology Program, University of Montana (UMT) and Science Advisor, Natural Resources Conservation Service (NRCS)
- Justin Gude, Wildlife Research and Technical Services Chief, Montana Fish, Wildlife, and Parks (FWP)
- Catherine Wightman, Sagebrush, Wetland, and Farm Bill Coordinator, FWP
- Michael Frisina, Adjunct Professor, Department of Animal and Range Sciences, Montana State University (MSU)
- Bok Sowell, Professor, Department of Animal and Range Sciences, MSU
- Austin Shero, District Conservationist, NRCS, Roundup, MT
- John Carlson, T&E Program Lead/Conservation Biologist, Bureau of Land Management (BLM), Montana/Dakotas State Office
- Floyd Thompson, Rangeland Management Specialist, BLM, Montana State Office
- Bill Creamer, Department of Natural Resources and Conservation
- Victoria Dreitz, Research Assistant Professor, Wildlife Biology Program, UMT
- Hayes Goosey, Research Scientist, Animal and Range Sciences, MSU
- Big Sky Upland Bird Association
- FWP Upland Game Bird Enhancement Program

Collaborations:

- **Montana State University**. We collaborate with Research Scientist Dr. Hayes Goosey, Department of Animal and Range Sciences, Montana State University, on a concurrent study that leverages our relationships with landowners and established grazing treatments and provides key data on food availability for greater sage-grouse hens and chicks in our study: "Modeling the Response of Food Insects of Sage-Grouse to Rest-Rotation Grazing".
- **University of Montana**. Ongoing partnership (since 2012) with Dr. Victoria Dreitz, Assistant Professor, Wildlife Biology Program and Director, Avian Science Center, The University of Montana on a concurrent study that leverages our relationships with landowners: "Assessing Land Use Practices on the Ecological Characteristics of Sagebrush Ecosystems: Multiple Migratory Bird Responses".

SOURCES OF SUPPORT

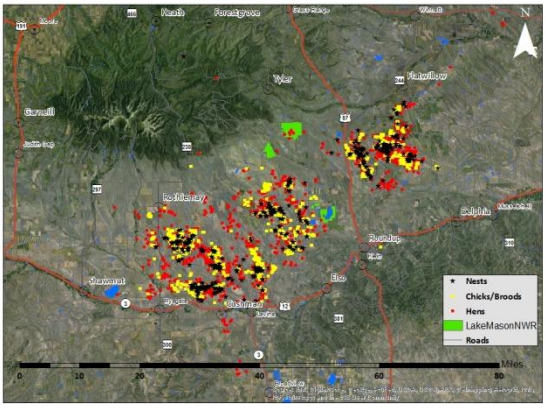
Funder	Support
USFWS Inventory & Monitoring Funds	$95,862.77 over 6/1/14 – 5/31/19, plus time from refuge technicians
FWP license sale funds and matching Pittman-Robertson funds administered by the USFWS	$133,333 / year
Intermountain West Joint Venture / Pheasants Forever	$242,000 over 4 years (7/1/12 – 6/30/16)
USBLM Grant/ Cooperative Agreement L15AC00097	$300,000 over 5 yrs (7/8/2015 – 7/7/2020)

CURRENT STATUS

LAKE MASON SATELLITE UNITS

From March 2011 to October 2015 the North and Lake Mason units of the Refuge have had some winter and fall use by our marked sage-grouse, particularly the North unit (Fig. 1).

(a)



(b)

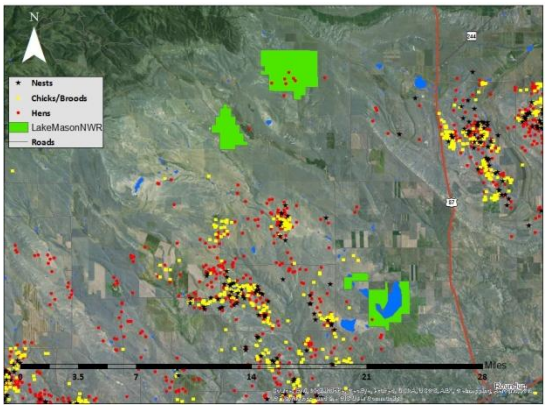
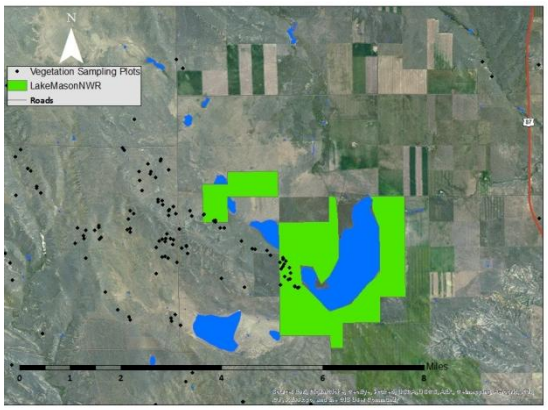


Figure 1. A map of grouse locations on the study area north of Lavina and north and west of Roundup, Montana, in Golden Valley (western portion) and Musselshell (eastern portion) Counties. (a) The entire study area. (b) A zoomed in view of the same map to show detail on the Lake Mason satellite refuge units. The maps include greater sage-grouse locations of hens, chicks/broods, and nests during the first 4.5 years of the study.

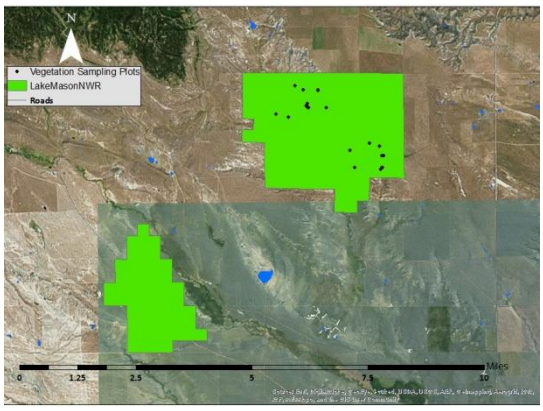
VEGETATION RESPONSE PLOTS

We completed data collection at 34 and 24 vegetation response plots on the Refuge in 2014 and 2015, respectively (Fig. 2a, b). For the entire study area we completed 359 and 221 vegetation response plots in 2014 and 2015, respectively, to assess the effects of grazing on sage-grouse habitat (Fig. 2c). Refuge staff helped us with collection of these data.

a)



b)



c)

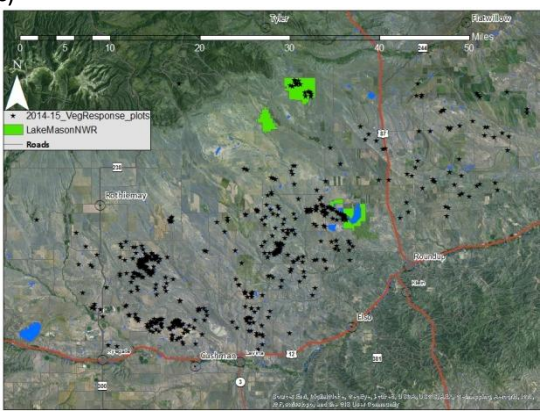
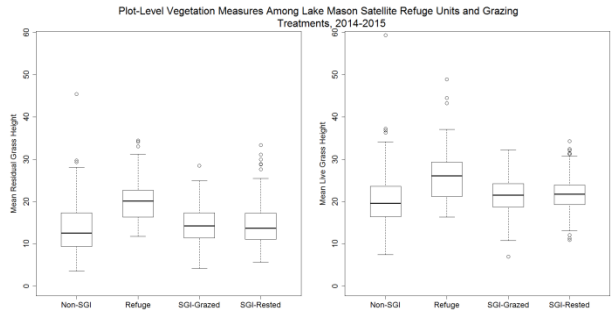


Figure 2. A map of vegetation plots completed on Lake Mason satellite units in Musselshell County, Montana, in 2014-2015: a) Lake Mason unit, b) North unit, and c) the entire study area.

We are using a repeated measures design to monitor changes in vegetation over time on the Refuge and thus sample the same plots each year. In 2015, we were able to measure 24 randomly chosen plots of the original 34 we sampled in 2014. These plots represent a baseline for vegetation before grazing because grazing has been absent from the Refuge for over 12 years. Data summaries of vegetation measured on the Refuge units and among grazing treatments show higher residual (previous year grass) and live grass (current year grass growth) heights on the Refuge units (Fig. 3a). Percent bare ground cover was lowest and percent litter cover highest on the Refuge units versus the other grazing treatments (Fig. 3b). Please note that these are data summaries and do not represent formal data analyses.

(a)



(b)

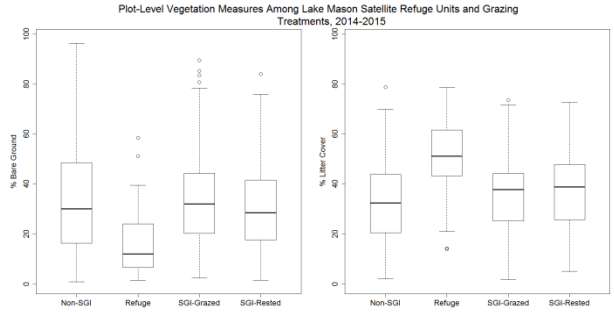


Figure 3. Box plots summarizing (a) residual and live grass heights, and (b) percent bare ground and litter cover collected from randomly selected plots on the North and Lake Mason satellite units of Lake Mason NWR, as well as on other grazing treatments, in Golden Valley and Musselshell County, Montana, 2014-2015.

We contracted with Open Range Consulting to create a GIS vegetation cover map that includes sagebrush, bare ground, and herbaceous cover percentages through continuous mapping and in 5% increments by cover classes at 1x1 meter and/or 30x30m resolution. The contractor has completed all work and delivered files in GIS format and all photos tagged to GPS locations. A copy of these files will be provided to USFWS.

INSECTS

By Hayes Goosey, Montana State University

The Lake Mason National Wildlife Refuge (LMWR) was sampled with pitfall traps during the mid to late sage-grouse brooding period during 2014 and 2015. Arthropods were identified to Family with a total of 7,730 specimens collected on the Refuge thus far. Sweep net samples taken in 2013 and 2014 are still being processed.

A Simpson's (1-D) diversity index was calculated for the LMWR and compared against diversities associated with Sage-Grouse Initiative (SGI) pastures which were either 'Grazed' or 'Deferred' during the sage-grouse early brooding time period. The Simpson's (1-D) index ranges from 0 – 1 and represents the probability that two individuals randomly selected from a sample will belong to different Families. The closer the number is to 1, the more diverse the sample. Comparisons were calculated using a Diversity Permutation test which compares the diversities using random permutations and provides a *p-value* representing the probability that the diversities are statistically similar. Results are presented in Table 1.

LMWR	Grazed	Deferred	*p-value*
0.86	0.89	---	<0.01
0.86	---	0.88	<0.01
---	0.89	0.88	<0.01

Table 1. Simpson's 1-D diversity indices for the Lake Mason National Wildlife Refuge (LMWR) and Sage-Grouse Initiative Grazed and Deferred pastures with Diversity Permutation p-values which indicate the probability that the diversity values within the same row are statistically similar.

Additionally, a Detrended Correspondence Analysis (DCA) was performed to elucidate any influence various land management practices may have on the structure of the invertebrate community. DCA is a weighted-average technique that reciprocally double-transforms and detrends non-linear community data to produce 'corresponding' sampling unit ordination. Results of this technique indicate that the arthropod community structure differs both spatially and temporally across sampling location and year (Fig. 4).

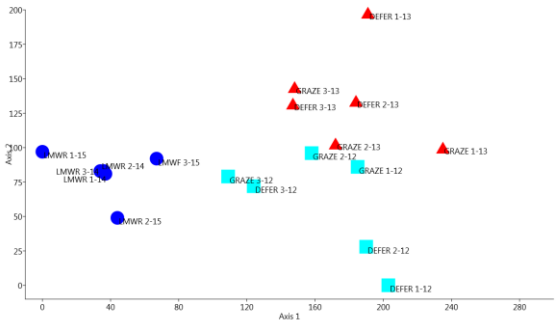


Figure 4. Detrended Correspondence Analysis of Lake Mason National Wildlife Refuge (LMWR) and Sage-Grouse Initiative (SGI) pastures where livestock were either present (Graze) or absent (Defer) during the sage-grouse early brooding period. Numbers following letter designations represent the sampling location and year, respectively. Blue circles represent samples taken on the LMWR during 2014 and 2015. Light blue squares represent samples taken during 2012 on SGI Graze and Defer pastures. Red triangles represent SGI Graze and Defer pastures during 2013. Spatially, the community structure of the LMWR is distinct from that sampled on SGI pastures (blue circles vs. non-blue circles); however, temporally this location displays much similarity suggesting that the arthropod community structure and abundances were similar over both sampling years. Within the SGI system, there is some indication of spatial similarity among grazed and rested pastures; however, the strongest ecological separation is evident between years regardless of pasture designation (light blue squares vs. red triangles).

Sampling at the LMWR recorded little temporal variation suggesting that the arthropod community was composed of similar Families in similar abundances during both sampling years; however the LMWR (blue circles) over sampling year has a distinct spatial community structure when compared to the SGI Grazed and Deferred pastures (non-blue circles). Within the SGI system, the most notable distinction is temporal variation between sampling years (light blue squares vs. red triangles) with minimal grouping being displayed spatially either within or across year. Further analyses of these data are forthcoming and will continue to elucidate the influences of dominant land uses practices, such as livestock grazing or long-term rest, on the abundance and community structure of rangeland arthropods in central Montana.

SAGE-GROUSE VITAL RATES, ENTIRE STUDY AREA

All of the information reported below represent preliminary data summaries and are not formal analyses unless otherwise noted. All results are preliminary and could change.

Hen Survival

We began the 2015 nesting season with 103 marked hens after our March-April 2015 capture efforts. Our annual survival estimates of hens are measured from Apr 1st at the start of nesting season through March 31st each year. Apparent annual survival estimates (number of hens alive at the end of the monitoring period / total number of hens alive at the start of the monitoring period) for all years of our study (Table 2) are comparable to that

Year / Season	Apr-May (Spring)	Jun-July (Summer)	Aug – Oct (Fall)	Nov – Mar (Winter)	Annual
2011	88%	91%	90%	79%	57%
2012	84%	93%	89%	82%	58%
2013	92%	86%	90%	89%	64%
2014	92%	100%	79%	87%	73%
2015	96%	98%	94%	Not complete yet	88% Ends March 31, 2016

Table 2. Apparent seasonal and annual survival (number of hens still alive / total number of hens monitored) of our marked population of greater sage-grouse hens in Golden Valley and Mussellshell Counties, Montana during 2015 for both SGI and non-SGI areas combined. Our annual survival is measured from Apr 1 – Mar 31.

Survival Estimate	Location	Reference
75 – 98%	Central Montana, our study area	Sika 2006
48 – 78%	Wyoming	Holloran 2005
48 – 75%	Idaho	Connelly et al. 1994
57%	Alberta	Aldridge and Brigham 2001
61%	Colorado	Connelly et al. 2011
37%	Utah	Connelly et al. 2011

Table 3. Summary of annual adult female greater sage-grouse survival estimates from several studies across the greater sage-grouse range.

observed in other studies across the range of sage-grouse (Table 3). The survival estimate for our marked population of hens in 2015 is on track to be within the observed range of hen survival in other studies.

We have defined seasons to represent biologically meaningful separations *sensu* Blomberg et al. (2013) and herein report seasonal survival estimates for 2015 (Table 2). There are few published seasonal survival estimates available for sage-grouse hens. Our seasonal estimates are comparable to those estimated by Blomberg et al. (2013) in a Nevada population of greater sage-grouse. Blomberg et al. (2013) monitored hen survival for 328 hens from 2003-2011. Their seasonal survival estimates were: spring = 0.93 or 93% ± 0.02 SE; summer = 0.98 ± 0.01 SE; fall = 0.92 ± 0.02 SE; and winter = 0.99 ± 0.01 SE. These seasonal hen survival rates are higher than our apparent survival estimates, but again we caution that we have not yet completed formal hen survival analyses. Blomberg et al. (2013) found very little annual variation in hen survival, allowing them to pool years and obtain one rate for each season (above). We have yet to evaluate interannual variation in seasonal survival rates and thus present our rates per year. Apparent winter survival is measured from Nov-Mar 2015 and has not yet occurred at the time of this report.

The Kaplan-Meier mean survival time estimate for all marked hens monitored since 2011 is 1,091 days (2.98 yrs; standard error [SE] = 68.2 days; 95% confidence interval = 745 – 1,375 days or 2.04 – 3.77 yrs) and the median is 856 days (2.35 yrs). This includes 206 hens and uses a staggered-entry design of individuals throughout the study period from 2011-present. We use right censoring for individuals with unknown fates, dropped transmitters, and for individuals that survive until their transmitters expire. For this analysis we pool data across all years. We have not yet done a formal analysis of survival as a function of grazing treatments or habitat metrics.

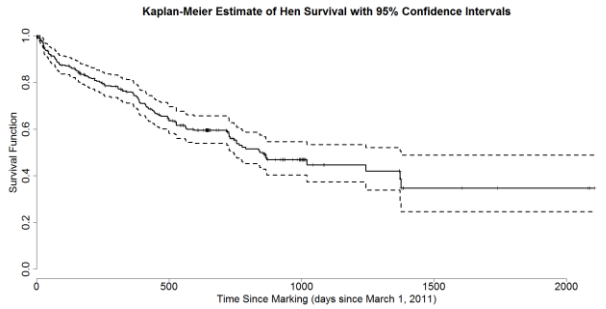


Figure 5. The Kaplan-Meier survival curve (solid line) and 95% confidence intervals (dashed lines) for greater sage-grouse hens monitored from 2011 – present in Golden Valley and Musselshell Counties, Montana.

Nest Success

We found and monitored 77 nests of hens from our marked population. Nests were monitored every other day until the nest hatched or failed. Hens that had failed nests were monitored for re-nesting attempts. We considered nests that hatched at least one chick as successful (Table 4).

Nest success varies from 14 – 86% across the entire range of sage-grouse (including studies from Oregon, Colorado, and Idaho; Connelly et al. 2004). The average nest success across the range is 46%

(Connelly et al. 2011). Nest success observed during all years of our study is within the range expected for sage-grouse.

	2011	2012	2013	2014	2015
Overall Nest Success	30%	54%	40%	64%	52%
Total Number of Nests	102	91	85	74	77
Number of 1st Nests / Nest success	79 / 28%	82 / 52%	69 / 39%	68 / 63%	69 / 54%
Number of 2nd Nests Nests / Nest success	22 / 41%	9 / 67%	15 / 40%	6 / 67%	8 / 38%
Number of 3rd Nests / Nest success	1 / 0%	-	1 / 100%	-	-

Table 4. Apparent nest success (number of monitored nests that hatched at least one chick / total number of nests monitored) of our marked population of greater sage-grouse hens in Golden Valley and Mussellshell Counties, Montana during 2011 – 2015 (SGI and non-SGI areas combined). Total number of nests monitored are presented as well as number of nests per nest attempt.

	2011	2012	2013	2014	2015
Total number of marked hens at the start of the nesting season	101	112	93	106	100
Hens attempting to nest out of all marked hens	78% (79/101)	73% (82/112)	76% (71/93)	64% (68/106)	66% (66/100)

Table 5. Percent of our marked population of greater sage-grouse hens that attempted at least one nest in Golden Valley and Mussellshell Counties, Montana during 2011 – 2015 (SGI and non-SGI areas combined).

Preliminary numbers show that of the 77 nests we monitored during the 2015 season, 69 were first nests and 8 were second nests (re-nesting attempts from failed first nests; Table 4). There are some hens each year that do not nest. During 2015, 66% of the marked population did attempt to nest at least once (Table 5). Re-nesting attempts of hens have been higher in years when nest failure rate was also higher.

Chick Survival

We captured 58 chicks at 2 to 8 days old from 33 successful nests and marked them with radio transmitters (no more than 2 chicks per brood were marked). Marked chicks were monitored every other day for the first couple weeks when mortality is highest, and then twice per week thereafter. Only chicks that were known to survive until their transmitter battery failed or were recaptured to be marked with an adult transmitter were considered to survive until the end of the monitoring period. Chicks whose signals were lost and their fates unknown were not considered alive for this estimate. Thus this apparent survival estimate (number of chicks known to be alive / number of total marked chicks) for chicks is conservative at 19% (11/58). These numbers could change as we are cleaning up data from this field season. Nine chicks known to have survived were re-marked with adult collars in Aug – Sep 2015 and continue to be monitored. There were possibly more chicks that survived, but we could not monitor their status because we could not access the private land where they were located. Thus these chicks have been censored in analyses.

These are preliminary results that have not yet been formally analyzed. Weather conditions during the sensitive post-hatch time, which peaks in early June for many prairie grouse, may have a large impact on chick survival (Flanders-Wanner et al. 2004). For example, many chicks get chilled and die during heavy rain events during the post-hatch period (Horak and Applegate 1998). We have not yet formally analyzed the effects of weather and other habitat variables on chick survival. Previous studies have shown chick survival to be variable and range from 12-50% during the first few weeks after hatching (Aldridge and Boyce 2007, Gregg et al. 2007, Dahlgren et al. 2010, Guttery et al. 2013). However, caution should be used when comparing

estimates among studies because the duration of monitoring periods differ. For example, Gregg et al. (2007) and Dahlgren et al (2010) monitored sage-grouse chicks for 28 and 42 days, respectively, whereas we are able to monitor chicks up to 110 days due to the recent availability of smaller, lighter radio transmitters with longer battery life. In addition, some studies measure "brood" survival (at least one chick from a brood lives) or unmarked chicks rather than monitoring individually marked chicks. Unmarked chicks are difficult to observe and monitor, and brood mixing may occur that results in broods containing chicks not parented by a particular hen. Thus there are limitations when comparing unmarked chick or brood survival estimates with telemetry survival estimates.

PROFESSIONAL ACTIVITIES COMPLETED

We hosted a meeting in Helena on Nov 4-5, 2015 with research groups from Utah, Idaho, and Montana that are doing greater sage-grouse grazing studies. We identified potential areas for collaboration in order to look at grazing across the range of sage-grouse. We will attempt a meta-analysis with all of our studies in five years.

Additionally, our research group completed the following:

- Landowner appreciation dinner, Jul 29, 2015
- Invited presentation on our research at Montana Wild in Helena Nov 9, 2015
- Provided information about our research to the Big Hole Watershed Committee that met in Nov 2015
- Invited presentation to the "Wildlife Habitat Conservation & Management" class at the University of Montana taught by Dr. Victoria Dreitz, Nov 16, 2015
- Invited presentation to the Charles M Russel NWR working group, Jun 8, 2015
- Invited presentation to the BLM State-wide Range Meeting in Billings, May 13, 2015
- Provided annual and biannual progress reports to funders: USFWS and FWP for Pittman-Robertson and license funds, respectively; Intermountain West Joint Venture and Pheasants Forever
- Provided regular updates throughout the year to private landowners and our oversight committee
- Hosted our annual oversight committee meeting Feb 3, 2015, in Helena

ACTIVITIES FOR THE NEXT YEAR

We are currently preparing to hire our seasonal field crew for the 2016 season and will begin trapping hens in March 2016. We will continue monitoring hen survival, nest success, chick survival, and habitat use during 2015 – 2016. We will continue sampling plots on Lake Mason satellite Refuge units for a 3rd and final year in 2016. We will continue to work on analyses and to communicate the progress of our study to landowners, our oversight committee, and partners/funders via regular communication and formal written updates. We are hosting the annual oversight committee meeting in Helena on Feb 8, 2016.

This year we are adding "grazing utilization" to the list of vegetation metrics on which we collect data. We are still collecting all of the data we usually do, but we are adding this metric to be consistent with other sage-grouse grazing studies and enhance our opportunities for collaboration and gain a better understanding of our how/why grazing impacts sage-grouse vital rates and habitat.

LITERATURE CITATION

Aldridge, C. L., and M. S. Boyce. 2007. Linking occurrence and fitness to persistence: habitat-based approach for endangered greater sage-grouse. Ecological Applications 17:508-526.

Aldridge, C. L., and R. M. Brigham. 2001. Nesting and reproductive activities of greater sage-grouse in a declining northern fringe population. Condor 103.

Blomberg, E. J., J. S. Sedinger, D. V. Nonne, and M. T. Atamian. 2013. Seasonal reproductive costs contribute to reduced survival of female greater sage-grouse. Journal of Avian Biology 44:149-158.

Connelly, J. W., C. A. Hagen, and M. A. Schroeder. 2011. Characteristics and dynamics of greater sage-grouse populations. Pages 53-67 *in* S. T. Knick, andJ. W. Connelly, editors. Greater sage-grouse: ecology and conservation of a landscape species and its habitat. Studies in Avian Biology (vol. 38). University of California Press, Berkeley, California, USA.

Connelly, J. W., S. T. Knick, M. A. Schroeder, and S. J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Unpublished report. Western Association of Fish and Wildlife Agencies, Cheyenne, Wyoming, USA.

Connelly, J. W., K. P. Reese, W. L. Wakkinen, M. D. Robertson, and R. A. Fischer. 1994. Sage grouse ecology. Study I: sage grouse response to controlled burn. Idaho Department of Fish and Game.

Dahlgren, D. K., T. A. Messmer, and D. N. Koons. 2010. Achieving better estimates of greater sage-grouse habitat. Journal of Range Management 74:1286-1294.

Doherty, K. E., D. E. Naugle, and B. L. Walker. 2010. Greater sage-grouse nesting habitat: the importance of managing at multiple scales. Journal of Wildlife Management 74:1544-1553.

Flanders-Wanner, B. L., G. C. White, and L. L. McDaniel. 2004. Weather and prairie grouse: dealing with effects beyond our control. Wildlife Society Bulletin 32:22-34.

Gillen, R. L. and P. L. Sims. 2006. Stocking Rate and Weather Impacts on Sand Sagebrush and Grasses: A 20-Year Record. Rangeland Ecology and Management, 59:145-152.

Gregg, M. A., M. R. Dunbar, and J. A. Crawford. 2007. Use of implanted radiotransmitters to estimate survival of sage-grouse chicks. Journal of Wildlife Management 71:646-651.

Guttery, M. R., D. K. Dahlgren, T. A. Messmer, J. W. Connelly, K. P. Reese, P. A. Terletzky, N. Burkepile, and D. N. Koons. 2013. Effects of landscape-scale environmental variation on greater sage-grouse chick survival. PLOS ONE 8:1-11.

Holloran, M. J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. Ph.D. Dissertation, University of Wyoming, Laramie, Wyoming.

Horak, G. J., and R. D. Applegate. 1998. Greater prairie chicken management. Kansas School Naturalist 45:3-15.

Sika, J. L. 2006. Breeding ecology, survival rates, and causes of mortality of hunted and nonhunted greater sage-grouse in central Montana. Masters thesis, Montana State University, Bozeman, Montana, USA.

Taylor, R. L., B. L. Walker, D. E. Naugle, and L. S. Mills. 2012. Managing multiple vital rates to maximize greater sage-grouse population growth. Journal of Wildlife Management 76:336-347.